

REMARKS

A petition for a one month extension of time has today been filed as a separate paper and a copy is attached hereto.

Claim 43 has been restructured and otherwise amended to conform to the teaching of the original specification at page 18, lines 16-23 which reads:

Therefore, if stress of the overall laminated films calculated by the equation is set to a stress limit ( $+3 \times 10^5$  dyne/cm on an Si film, or  $+2 \times 10^5$  dyne/cm on an aluminum film) and then thickness and stress of individual insulating films are determined not to exceed this stress limit, cracks in the interlayer insulating films can be prevented. [Emphasis added]

In the above teaching, "the equation" has reference to the formula presented at page 17, lines 32-34 and in claim 43 here.

The rejection of claim 43 for obviousness over Itoh et al in view of Machado et al is respectfully traversed. In paragraph 5 of the office action the examiner characterizes Itoh et al as teaching "... wherein the total stress in said insulating layers is limited to less than  $2 \times 10^5$  dyne/cm so as to suppress bending of said interconnection layer." The undersigned cannot find such a teaching anywhere in Itoh et al. Moreover, Itoh et al teach absolutely nothing with regard to a total stress, i.e., a total for all insulating layers. There is nothing in the teachings of Itoh et al which would suggest that total stress, for all layers, is of any concern.

The examiner characterizes Machado et al as teaching “that the stress of a film depends on the film thickness, deposition rate, deposition temperature, among other parameters (column 2, lines 59-65). [Emphasis added]. From that teaching of Machado et al which relates to a single-layer film, the examiner jumps to a number of conclusions which simply do not logically follow. An explanation of stress in a single-layer film does not suggest that total stress for a multilayered structure should even be considered, much less that such total stress should be less than some maximum value.

Thus, neither Itoh et al nor Machado et al in any way suggests controlling the thickness of a top-most layer of a multi-layer insulating film to provide an overall (total) stress for all layers less than a specified maximum. Moreover, neither Itoh et al nor Machado et al mention total stress, much less suggest its adjustment (control) in the manner claimed here.

Even if the examiner’s characterization of the teachings of the references were correct, those teachings would not have led to the setting of total stress as defined at less than some predetermined value. The examiner asserts that the formula for calculating total stress set forth in claim 43 is “inherent”. However, Machado et al teaches only that the stress depends on film thickness: stress of a single layer film = f (film thickness), wherein the specific form of the function “f” would be unknown.

Applicants’ invention utilizes a particular function “f” which provides a calculated stress quite close to actual stress, as evidenced by Fig. 10(b) of the drawings. In other words, the

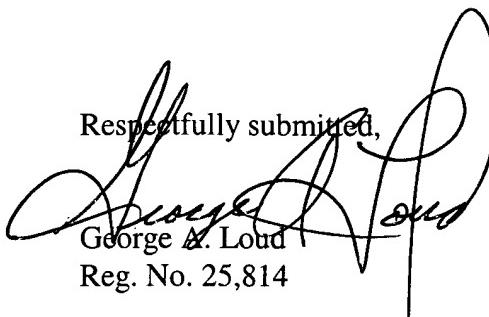
present invention utilizes a discovered equation that can approximate the actual stress with high precision. Further, that the total stress for all layers should be less than some predetermined value is further removed from anything “inherent.”

The rejection of claim 47 as set forth in paragraph 6 of the office action over Itoh et al in view of Machado et al and further in view of Matsuura et al is also traversed. Matsuura et al is cited by the examiner only for its disclosure of CVD processes using a gaseous admixture of an organic silane and oxygen. Accordingly, the reasons given above in traverse of the rejection of claim 43 for obviousness are equally applicable to the rejection of claim 47 for obviousness.

New claim 53 recites a process which is exemplified by the formation of the structure shown in Fig. 10(A) as described at page 21, line 29 to page 23, line 16 of applicants’ original specification. New claim 53 defines a method resulting in a structure wherein three layers in a specific sequence, i.e., two compressive layers separated by a single tensile layer, are provided between adjacent aluminum interconnection layers. Such a method is in no way suggested by the references.

In conclusion, it is respectfully requested that the examiner reconsider the rejection of record with a view toward allowance of the three pending claims.

Respectfully submitted,

  
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Dated: August 7, 2003

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